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Believing that insufficient attention has been given to the higher fungi as a cause of disease in animals, Guéguen[9] has compiled a volume containing descriptions of all fungi which have been reported parasitic on man and other animals. The material, including the Myxomycetes, is arranged in the following order: Myxomycetes, Oomycetes, Basidiomycetes, Ascomycetes, and Fungi Imperfecti. To the description of each species are added notes on the pathology of the organism so far as known. All fungi that have been reported on animals, even the lowest, are included. Full references to literature are given at the end of each chapter. The volume as a whole will be of greater interest to pathologists than to botanists.—H. Hasselbring.

Hallier[10] has published a résumé of the more important features of his natural system of classification[11] with some corrections and additions, which are here noted. The Hydnoraceae and Balanophoraceae are held to be derived through parasitism from epiphytic Cactaceae; the Gnetaceae do not belong to the gymnosperms, but are reduction forms near the Loranthaceae, Myzodendraceae and Santalaceae; and Casuarina is nearly related to Betula and Alnus.—C. J. Chamberlain.

NOTES FOR STUDENTS.

In a note in the Comptes Rendus,[12] Réné Maire summarized the results of his cytological study of the mitosis in the ascus of *Galactinia succosa*, describing the existence of "protochromosomes," or chromatic granules formed during the prophases of the first division, and which united during the metaphase into the four chromosomes of the equatorial plate. In a more recent publication,[13] based upon a more detailed study of Galactinia as well as several other Ascomycetes, Maire has endeavored to explain the significance of the protochromosomes and to recognize certain specific characters of the first division in the ascus. He believes this division to be heterotypic, comparable to the heterotypic division of higher plants. The secondary nucleus of the ascus at the time of its greatest size shows long, fine, much intermixed chromatic filaments, which have been furnished to it by the two primary nuclei. Later these chromatic filaments approach and fuse two and two. It has been impossible to determine whether or not this bivalence is a result of a folding of a single thread or of the union of two different filaments. At this time the filaments are collected to one side of the nucleus into a compact synaptic ball, which later undergoes complete dissolution into chromatic granules or protochromosomes. At the time the centrosomes and the

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[9] Guéguen, F., Les champignons parasites de l'homme et des animaux. 8vo. pp. 299. *pls. 10.* Paris: A. Joanin & Cie. 1904. 20fr.

[10] Hallier, H., Neue Schlaglichter auf das natürliche System der Dikotyledonen. Phylogenetische Betrachtungen. Imp. 8vo. pp. 15.

[11] Bot. Gazette **35**:223. 1903.

[12] Compt. Rend. Acad. Sci. Paris **137**:769. 1903.

[13] Maire, Réné, Recherches cytologiques sur quelques Ascomycètes. Ann. Mycol. **3**:123–154. *pls. 3–5.* 1905.

internuclear aster appear, these protochromosomes leave the achromatic substance, being attracted about four centers to form the four definite chromosomes. Each of the four definite chromosomes undergoes a longitudinal fission, the two halves of which separate at the metaphase, undergoing a new longitudinal splitting during their passage to the poles. This second split is often very distinct during the anaphase of this division, when eight chromosomes may be counted. During the prophases of the second division eight chromatic elements reappear, which unite two and two to form the definite chromosomes of the equatorial plate. The two halves of each chromosome separate, four passing to each pole. The first division of the ascus MAIRE believes therefore to be preceded by a true synapsis, very similar to that described by STRASBURGER for *Thalictrum purpurascens*. He believes the protochromosomes should be interpreted as the gamosomes of STRASBURGER. The segregation and re-collection of the chromatin of two primary nuclei assures a complete rearrangement of the chromatin in the definite chromosomes of the secondary nucleus. MAIRE designates the fusing nuclei as primary and the resulting fusion nucleus or ascus nucleus as secondary. These phenomena, together with the longitudinal splitting preceding the metaphase of the first division, and the longitudinal fission during the metaphase of the second division, which split is much more complete than in phanerogams, all show that the first mitosis in the ascus is heterotypic, analogous to the first division of all normal spore mother-cells, while the characters presented by the second mitosis are those of a homotypic division. MAIRE further believes that the third division is a typic one, where the spirem directly segments into the four chromosomes, which only divide at the metaphase. The proof that the first division in the ascus is heterotypic certainly favors the view that the numerical reduction of chromosomes occurs immediately after the fusion which produces the nucleus of the ascus. This hypothesis finds support in the fact that the number of chromosomes in the mitoses in the ascus and in the ascogenous hyphae is the same as in *Pyronema*. MAIRE has not been able to count the chromosomes of the ascogenous hyphae. He admits the fact that the number of chromosomes may vary in different species of the Ascomycetes, just as this number varies in higher plants, instead of being always four as he has previously maintained. In *Galactinia succosa* the centrosomes and the spindle have an intranuclear origin, while the polar radiations have an extranuclear origin, developing independently of the intranuclear part of the achromatic figure. The ascus presents the cytological characters of secreting cells. In the epiplasm are found basiphile granules entirely distinct from the metachromatic granules, and often a sort of latex. The nucleus is able to take an active part in the elaboration of certain secretory products.—J. B. OVERTON.

A RECENT paper by FISCHER[14] on the Cyanophyceae, while reaffirming in the main his earlier conclusions,[15] presents some further additions to the cytology of this group, a subject which is already overburdened with the results of much speculation rather than careful and accurate observation.

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[14] FISCHER, A., Die Zelle der Cyanophyceen. Bot. Zeit. 63^1:51–130. *pls. 2.* 1905.

[15] FISCHER, A., Untersuchungen über den Bau der Cyanophyceen und Bakterien. Jena. 1897.

FISCHER's results on the microchemical detection of certain substances in the cell are far from convincing, since a comparison with the opposed results of other authors leads rather to a realization of our needs of trustworthy microchemical tests for distinguishing certain carbohydrates and proteids than to FISCHER's conclusions It is not at all demonstrated that FISCHER is able even to distinguish with certainty between a carbohydrate and a proteid substance, although he seems to be perfectly sure of his test.

A new test is given for glycogen, which FISCHER designates as the "tannin-safranin stain." He regards glycogen as the first visible product of assimilation. This is produced in the Cyanophyceae in such large quantities that, although in some instances 75 per cent. of the cells of a filament may be using up this food-substance in active division, there is always left a surplus which is stored up in the "central body." In large species, *e. g.*, *Oscillatoria princeps*, the central body is large enough for the storage of a considerable amount of unchanged glycogen, which in the treated sections assumes the form of large granules and irregular masses.

FISCHER's test for glycogen in this instance may be called into serious question, since the majority of writers on this subject interpret these same bodies as of a proteid nature and not carbohydrate. We are left in serious doubt, in fact, as to whether FISCHER's glycogen granules are to be referred to the albuminous "slime globules," or to the "chromatin granules" of earlier authors, both of which bodies may be readily detected in the "central body" of the larger Oscillatorias.

FISCHER concludes on the other hand, that in the smaller forms, the limited room for storage necessitates the condensation of the glycogen, hence it is here converted into another carbohydrate, "anabaenin," which is stored up in the central body, either in the form of *Zentralkörnern* or as "pseudomitotic" loops. The number of these twisted rods is in some instances apparently constant, and, further, their similarity to chromosomes and their equal division between the two daughter cells arises, according to FISCHER, from the striving, not after an equal distribution of valuable material, but only the distribution of "lästigen Ballast"!

The author thinks that it is probable that this "carbohydrate mitosis" may be the forerunner of the nuclear mitoses of such low forms. At first it is merely a ballast-divider; but later, nuclein might be deposited, and then the central body would assume the true nuclear character. But FISCHER denies emphatically that the central body as it is at present is a nucleus; nevertheless he would agree that nuclein-like substances also occur in the Cynophyceae, but holds that they exist in a finely divided state in the cytoplasm and are not yet formed in special bodies. He thus returns to the old, much-exploited view of the scattered or distributed nucleus. Such scattered nuclein bodies he fails to show, however, in any of his figures.—EDGAR W. OLIVE.

ITEMS OF TAXONOMIC INTEREST are as follows: N. L. GARDNER (Univ. Calif. Publ. Bot. **2**:169–180. *pl. 18*. 1905) has described a new genus (*Nigrosphaeria*) of ascomycetous fungi, parasitic on Pseudhydnotria, one of the Tuberaceae.—N. L. BRITTON (Bull. N. Y. Bot. Garden **4**:115–127. 1905), in a second paper entitled "Contributions to the flora of the Bahama Islands," has described new species of Coccolobis, Caesalpinia, Canavalia, Hibiscus, Heliotropium (2), Lantana (2), Cestrum, Stemmodontia, and Anastraphia.—W. A. MURRILL in his twelfth paper on the Polyporaceae of North America (Bull. Torr. Bot. Club **32**:469–493. 1905) has described twelve new genera of this family (*Irpiciporus, Dendrophagus, Spongiporus, Rigidiporus, Earliella, Cubamyces, Coriolellus, Microporellus, Flaviporellus, Aurantiporellus, Aurantiporus, Pycnoporellus, Phaeolopsis*), making new names for species formerly referred to Boletus, Polyporus, Fomes, or Trametes. Earliella alone is possibly new.—K. K. MACKENZIE (*idem* 495–506) describes three new varieties and creates two new specific names under Onosmodium, and refers *O. Thurberi* to *Macromeria Thurberi*.—In a sixth paper on Crataegus (Rhodora **7**:162–164. 1905) C. S. SARGENT describes two new species of Tomentosae.—M. L. FERNALD (*idem*) refers the common *Symphoricarpos racemosus* Auct., with leaves glabrous beneath, to the new var. *laevigatus;* those with leaves pilose beneath to the type, and those with leaves whitened beneath to var. *pauciflorus*.—A. BORZI establishes (Nuova Notarisia **16**:20. 1905) two new genera of Chrococcaceae, *Planosphaerala* and *Bacularia*.—W. A. SETCHELL describes (*idem* 59–63) a new genus, *Peyssonneliopsis*, a parasitic alga distributed under a manuscript name in 1903, as no. 649 of the Phycotheca Boreali-Americana.—MAX FLEISCHER (Hedwigia **44**:301–329. 1905) describes as a new genus of the Indian Archipelago, *Aerobryopsis*, to receive ten species mostly belonging to a section of Neckera, Eriocladium, which, though preoccupied, was raised to generic rank by DUSÉN. A dozen new species, all issued in Exsicc. Musci Archipel. Ind. Series VII. 1904, are also described.—F. BUBÁK and E. KABÁT (*idem* 350–358) describe new species of fungi from Bohemia; Phyllosticta (3), Vermicularia (1), Ascochyta (3), Diplodina (1), Leptothyrium (4), and Ramularia (1).—H. CHRIST (*idem* 359–370) publishes the list of ferns collected by ULE in the Amazon region, including one new species each of Elaphoglossum, Polypodium, Pteris, Lindsaya, Asplenium, Aspidium, Alsophila, and Danaea.—The whole of the first part of vol. 38, Engler's Bot. Jahrb., is devoted to descriptions of new species of African plants. The following new genera are established: by R. SCHLECHTER (Bot. Jahrb. **38**:1–56. 1905) *Auxopus, Genyorchis* (Orchidaceae), and *Neoschumannia* (Asclepiadaceae); by H. HARMS (*idem* 74–79) *Platycelyphium* and *Stemnocoleus* (Leguminosae); by A. ENGLER (*idem* 94–101) *Dicraeanthus, Winklerella* (Podostemonaceae) and *Tridesmostemon* (Sapotaceae).—C. R. B.

IN THE large literature on Bordeaux mixture, secondary physiological effects on plants, not due to the fungicidal action of the mixture, have frequently been described. These effects are of two kinds: first, a stimulating effect, resulting in darker green, thicker foliage, with increased starch production and decreased transpiration; second, direct toxic action on the foliage and fruits. The whole question, on which many conflicting views have been published, has been critically examined by SCHANDER.[16] Many writers have attributed the stimulating action of Bordeaux mixture to the entrance of small quantities of copper into the plant, both through the cuticle and through the stomata. SCHANDER finds that leaves injected with a solution of $CuSO_4$, 1 part in 10,000,000, and allowed to lie in the solution 24 hours, showed poisonous effects, while much more concentrated solutions were unable to penetrate the uninjured epidermis when applied externally. The argument is that the cuticle prevents the penetration of very dilute solutions of copper, such as might result from solution of the particles of copper compounds applied to the leaf, but if any copper enters the cells the results are injurious, never stimulating. By growing plants in water cultures with dilute solutions of copper, it was found that the young roots were gradually killed, whereupon another crop of roots was formed, which also was finally killed, etc. Here again there was no stimulating action, although the top of the plant remained uninjured, showing that the copper was accumulated by the root cells, even from very dilute solutions, but was not passed on into the vascular system. In soils, a more concentrated solution of copper was required to produce toxic effects on account of their absorption. By appropriate experiments it is also shown that neither the lime compounds nor the traces of iron produce stimulating effects.

The true explanation of the phenomena is found in the physical action of the coating itself. The same results were produced by shading plants with glass to which a spray of Bordeaux mixture had been applied, also by the use of thin paper or dust. Good results were obtained only in bright sunny weather, while injury resulted during cold rainy seasons. This, no doubt, explains the conflicting reports of various investigators. The toxic effect of the mixture is found to be due to solution of the copper, caused by the secretions of glandular hairs as in the peach, phaseolus, and sunflower.—H. HASSELBRING.

THE FINAL sections of DAVIS'S *Studies on the plant cell*[17] have appeared. Section IV deals with cell unions and nuclear fusions. The subject is treated under three heads: (1) protoplasmic connections between cells, (2) sexual cell unions and nuclear fusions, and (3) asexual cell unions and nuclear fusions. The writer says, "The test of a sexual act must lie with the history of the elements which fuse. If they are shown by their morphology and developmental history to be sexual cells or gametes, then their fusion becomes a sexual process." Asexual unions and nuclear fusions are treated under three heads: (1) cell fusions which have apparently no sexual relations, (2) cell fusions which are substitutes for a normal ancestral sexual process now suppressed, and (3) extraordinary modifications of what may have been originally sexual processes but which at present serve some peculiar and special function.

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[16] SCHANDER, R., Ueber die physiologische Wirkung der Kupfervitriolkalkbrühe. Landw. Jahrb. **33**:517–584. 1904.

[17] DAVIS, B. M., Studies on the plant cell. Amer. Naturalist **39**:217–268, 449–499, 555–599, 695–740. 1905.

Section V deals with cell activities at critical periods of ontogeny in plants. The literature is discussed under the headings, apogamy, apospory, hybridization, and xenia. Historical accounts are given, but most of the space is devoted to cytological papers of the last three or four years. About 150 papers are cited in the bibliography. Section VI, which concludes the series, is entitled "Comparative morphology and physiology of the plant cell." The material is treated under the heads: the simplest types of plant cells, comparisons of the structures of some higher types of plant cells with simpler conditions, some apparent tendencies in the evolution of mitotic phenomena, the essential structures of the plant cell and their behavior during ontogeny, and the balance of nuclear and cytoplasmic activities in the plant cell.

The series as a whole contains a fuller treatment of the subject than that given in KOERNICKE'S recent paper, *Der heutige Stand der pflanzlichen Zellforschung.*[18] The writer's personal views are expressed freely throughout the work. The bibliography of recent literature is quite complete.—C. J. CHAMBERLAIN.

LANG[19] has studied the structure and development of Cyathodium, a tropical genus of Marchantiaceae. The few species occur in the deep shade of tropical forests, in dark caves, in the crevices of walls, or even on paths in more exposed positions. The two forms studied (*C. foetidissimum* Schiffn. and *C. cavernarum* Kunze) were collected in the Malay Peninsula and the material was preserved in alcohol. One interesting feature of the investigation was that it made possible a comparison between one of the least reduced and the most reduced form in the genus. The antheridia are borne on small disk-shaped antheridiophores, developed from the lower surface of the thallus, and at maturity are essentially similar to those of other Marchantiaceae. LEITGEB'S surmise that the antheridial wall is not formed of a layer of cells was definitely set aside for both species. In both species the archegonia stand on the morphologically upper surface of the thallus, in *C. cavernarum* actually retaining this position, but in *C. foetidissimum* becoming displaced so as to appear to be borne upon the under surface. The development of the sporogonium in the main resembles that of other Marchantiaceae, the sporogenous tissue and the greater part of the wall of the capsule being derived from the epibasal cell, and the foot and the base of the capsule wall being derived from the hypobasal cell. The four cells at the base of the foot grow out into a number of relatively long tubular processes, each of which may branch once or oftener, thus greatly increasing the absorbent surface of the foot. The conclusion is reached that the supposed close relationship of the genus with Targionia is confirmed; and that it is probably a reduction group of species, derived from a form not unlike Targionia by adaptation of the gametophyte to shady and damp situations, and by changes in the sporogonium induced by the alterations in the gametophyte.—J. M. C.

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[18] See BOT. GAZETTE **39**:30–31. 1905.

[19] LANG, WILLIAM H., On the morphology of Cyathodium. Annals of Bot. **19**: 411–426. *pls. 21–22.* 1905.

Drimys, a genus of the Magnoliaceae, and a neighboring genus, Trochodendron, have long been known to resemble gymnosperms in the structure of their wood, which consists entirely of tracheids with bordered pits. Hallier, in his recent scheme of phylogeny, places Drimys in the Drimytomagnoliaceae, an hypothetical group of the Magnoliaceae derived from the Bennettitales or nearly related Cycadales. A paper by Strasburger[20] gives the results of a study of the ovule, embryo sac, fertilization, and endosperm and early stages in the development of the embryo of *Drimys Winteri*. In all these particulars the development is that of a typical angiosperm, with not the slightest suggestion of gymnosperm characters!

Strasburger takes this occasion to express his views as to the nature of the endosperm and embryo-sac structures. The formation of endosperm is still regarded as a continuation of an interrupted development of the prothallium, the fusion of polar nuclei which precedes it being a secondary phenomenon. In the usual development of the embryo sac the two polar nuclei lie in a mass of cytoplasm surrounded by a common plasma membrane. Under such conditions it is usual for nuclei to fuse. The synergids are not regarded as eggs, but rather as cells of the prothallium. The condition found in the ovules of Gnetum is not regarded as a forerunner of the condition found in the embryo sacs of angiosperms. Gnetum is rather the last member of a line of development.—Charles J. Chamberlain.

Wiesner has recently written several papers on leaffall,[21] one of which, on summer leaffall, has been reviewed in the Botanical Gazette.[22] A second paper deals with *Trieblaubfall*, or leaffall in connection with the development of leaf buds, and of course found only in evergreens. This type of leaffall is associated with ombrophily, a habit characteristic of essentially all evergreens. The external factors which so strongly influence leaffall in summergreens are of little account here. The third paper treats of frost leaffall. If the absciss layer freezes, the leaf drops at once, but if the rest of the leaf freezes, while the absciss layer remains unfrozen, leaffall occurs more slowly. In some cases leaffall is due to high turgescence in the cells of the absciss layer. The final paper is a presentation of the biological significance of leaffall, and the author's conclusions are the result of many years of investigation. Leaffall is absent in plants where leaves and stems die simultaneously, as in ephemerals, most annuals and biennials, and monocarpic plants generally. Leaffall is absent in most herbs, and present in most woody plants, especially in those which require much light in connection with bud development; this light is secured when the leaves have fallen. Leaffall is less pronounced or even absent in woody plants whose buds never lack sufficient light. Leaffall occurs in woody plants after injury or death, or when they develop in conditions where normal functions cannot be performed.—H. C. COWLES.

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[20] Strasburger, E., Die Samenanlage von *Drimys Winteri* und die Endospermbildung bei Angiospermen. Flora **95**:215–231. *pls. 7–8.* 1905.

[21] Wiesner, J., Ueber den Treiblaufall und über Ombrophilie immergrüner Holzgewächse. Ber. Deutsch. Bot. Gesells. **22**:316–323. 1904. Ueber Frostlaubfall nebst Bemerkungen über die Mechanik der Blattablösung. *Idem* **23**:49–60 1905. Die biologische Bedeutung des Laubfalles. *Idem* **23**:172–181. 1905.

[22] Bot. Gazette **38**:153. 1904.

CHANDLER[23] has examined the "seedlings" of a number of ferns, mostly belonging to Polypodiaceae. In nearly all the cases studied a protostele was found to pass into the condition of siphonostele or dictyostele by the appearance, inside the xylem of the central cylinder, first of phloem, then of endodermis, and lastly of fundamental tissue which communicates at the foliar gaps with the fundamental tissue of the cortex. Usually several leaf traces are given off before the central cylinder incloses fundamental tissue, and at this level the core of the central cylinder consists of phloem. The writer concludes that "the primitive type of vascular system in the ferns is a solid rod of vascular tissue, which may be a solid xylem strand surrounded by phloem, or an amphiphloic strand." The writer follows JEFFREY in considering the parenchymatous pith of the central cylinder to be of the same morphological nature as the cortex; curiously enough he hesitates to apply this generalization to certain species of Osmunda, though he considers the rule to hold good for *O. cinnamomea.* The results of the investigation seem to confirm the view that the ontogeny of the vascular system resembles what has probably been its phylogeny. The change from a solid to a tubular central cylinder is attributed to the necessity for an efficient attachment of the leaf traces. The mode of origin of double leaf traces in several genera is carefully described, and well represented in the plates accompanying the paper.—M. A. CHRYSLER.

Within the past few years, Dr. LUJO ADAMOVIČ has published a number of papers dealing with the plant geography of Servia. A recent contribution[24] has to do with the sand steppes of that country. This is not a single unified formation, but comprises a group of formations, similar in ecology, distribution, and life-history. Meadows contain hygrophiles, grasses which form close mats, and there are but few annuals or coarse herbs; steppes, on the contrary, contain xerophiles, and there are many annuals and coarse herbs; heaths are in places where soil and air are wet, and they contain half-shrubs, among which a single species often dominates. The life-history of the sand steppes is interesting. Sand commonly encroaches on vegetation, but the reverse is the case in wet years.

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[23] CHANDLER, S. E., On the arrangement of the vascular strands in the "seedlings" of certain leptosporangiate ferns. Annals of Bot. **19**:365–410. *pls. 18–20.* 1905.

[24] ADAMOVIČ, L., Die Sandsteppen Serbiens. Engler's Bot. Jahrb. **33**:555–617. 1904.

The pioneer plant of the drifting sand is the delicate annual, *Polygonum arenarium;* a Veronica and a Tragopogon are other early plants. No grasses appear among the pioneers, though a Festuca appears the second year, with a Euphorbia; before long, these later species form mats and exclude the first named. When the dunes have become well covered with vegetation, and rather thoroughly established, they are termed *Sandpussten.* Plants found exclusively in sand are termed psammophytes, while those found elsewhere but preferring sand are termed psammophiles. The photographs accompanying the paper well illustrate the dunes and the *Pussten.*—H. C. COWLES.

A SERIES of five papers by BROWN and ESCOMBE record the fundamental researches made by these investigators at Kew during a period of three years. The paper here cited[25] is the largest of the series and to it the others are supplementary. Part I is descriptive of apparatus devised by the authors for accurately determining the amount of CO_2 in air before and after photosynthesis. The rate of photosynthesis as determined by the direct measurement of CO_2 entering was found to be one-third to one-fifth that found by SACHS with his method of increase in dry weight. When all sources of error were accounted for, the discrepancy was reduced to 50 per cent. An investigation of SACHS's method shows that the errors are cumulative, so that it is very unreliable. The estimation of foliar respiration as made by the authors agrees with that made by BLACKMAN. An investigation of the "energetics" of the leaf shows that only a small part of the radiant energy incident upon a leaf is used for photosynthesis, the "economic coefficient" being only 6.5 per cent. in full sunshine. Even in moderate light the supply of photosynthetic energy is far greater than the leaf can use. The surplus of energy which the leaf is compelled to absorb is dissipated by the vaporization of water in transpiration and by the thermal emissivity required in the constant adjustment of the temperature of the leaf to that of the surrounding air.—RAYMOND H. POND.

AT THE suggestion of Professor WITTROCK, HESSELMAN[26] undertook the completion of an investigation begun by STENSTRÖM, but broken off upon the latter's death in 1901. Having noticed that in Sweden southern slopes are often covered by pines, and northern slopes by spruce, and that birch woods ascend higher on sunny than on shady mountain slopes, STENSTRÖM determined upon a careful study of the distribution of plants on slopes of various directions. He chose for this study railway embankments, because they present similar soils and all kinds of slopes. The results obtained were very uniform, southern slopes having chiefly xerophiles or weeds (such as *Anthemis tinctoria, Convolvulus arvensis, Barbarea vulgaris*), and northern slopes having a more closed and mesophytic vegetation (with *Aira cespitosa*, *Ranunculus acris*, etc.). No differences of moment were observed between east and west slopes. Although no close study of factors was made, it was clear that the direct influence of radiation, or its influence on moisture and temperature, is the controlling element. A figure is given of a valley in Lapland with a wood of birch with scattered pine and spruce on the southern slope, and a tundra with *Salix herbacea*, *Andromeda hypnoides*, and other characteristic forms on the northern slope.—H. C. COWLES.

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[25] BROWN, H. T., and ESCOMBE, F., Researches on some of the physiological processes of green leaves, with special reference to the interchange of energy between the leaf and its surroundings. Proc. Roy. Soc. B. **76**:29–112. 1905.

[26] HESSELMAN, H., K. O. E. Stenström's Studier öfver Expositionens Inflytande på Vegetationen. Arkiv för Botanik **4**:1–54. 1905.

SALMON has extended his investigations on the specialization of parasitism in the Erysiphaceae to include the ascospores of several forms.[27] In former experiments with conidia it was found that conidia from *Bromus commutatus* would infect *B. hordeaceus* but not *B. racemosus* or *B. mollis*. *B. hordeaceus*, however, acts as a "bridging species," so that if conidia from *B. commutatus* are used to inoculate *B. hordeaceus*, the conidia produced on *B. hordeaceus* will in turn infect *B. mollis*. A similar specialization occurs in the ascospores. Ascospores from *B. commutatus* infect *B. hordeaceus*, but not *B. racemosus*. The conidia produced from the former infection were then used to infect *B. mollis*.

Another series of experiments was performed in order to see whether *E. graminis* from wheat, which also infects *Hordeum silvaticum*, could by continuous culture on *H. silvaticum* be made to lose its power of infecting wheat. The fungus was cultivated for five generations on Hordeum, but showed no signs of losing its power of infecting wheat. Successive generations of the fungus on Hordeum seemed to show a weaker power of infecting that plant, but this is probably explained by the fact that only the younger leaves of Hordeum are susceptible to infection.—H. HASSELBRING.

OLIVER and TANSLEY give a detailed account of their methods for surveying vegetation, applicable where the ground is reasonably flat.[28] The two methods employed, the method of squares and the gridiron method, are related, and their especial advantage is to exhibit the characteristics of an area where the vegetation is complex and yet definitely related to physiographic features. These methods have been employed in the salt marshes of the north coast of Brittany, and in some respects resemble the quadrat methods used by CLEMENTS. The method of squares is employed for mapping on the scale of 1:250 or 1:500, squares one hundred feet each way being made from a base line; such squares correspond to a five-inch square in the notebook. The gridiron method is used for detailed work, an area twenty-five feet square being measured out; this area is then divided off by tapes into smaller areas, 5×25 feet. Here six inches correspond to one-tenth of an inch in the notebook, so that great accuracy can be secured. The methods could be advantageously modified by the use of metric units and relations.

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[27] SALMON, E. S., On specialization of parasitism in the Erysiphaceae. III. Ann. Mycol. 3:172–184. 1905.

[28] OLIVER, F. W., and TANSLEY, A. G., Methods of surveying vegetation on a large scale. New Phytol. 3:228–237. 1904.

On the maps, samples of which are given, physical features are represented by continuous lines, plant associations by dotted lines, and contour lines by alternating dots and dashes.—H. C. COWLES.

THE RELATIONS of *Arum maculatum* with insects, as described by HERMANN MÜLLER and others, have become so much a part of the literature of entomophily that it is a distinct shock to read the testimony of GERARD,[29] as given at a recent meeting of the Linnean Society. The current account is contradicted as follows: "The obstruction caused by the hairs is not such as of itself to prevent the insects escaping;" for "the hairs are not stiff or sharp; they do not point consistently downwards; frequently they are not in the narrow throat of the tube; they are so far apart as to leave ample room for such small insects [as those that habitually visit the plant] to pass between them; they never extend to the walls of the chamber, leaving a free passage in that direction;" and, besides, insects may be observed to escape. That many insects do not escape is evident, which the observer explains as follows: "The truth seems to be that the plant drugs the insects, reducing them to a state of imbecility, which is the true cause of their inability to get away; and that finally they not only die from the effects of the treatment, but their succulent portions are absorbed by the Arum, which thus claims to rank as carnivorous."—J. M. C.

IN A PAPER entitled *Evolution of cellular structures* COOK and SWINGLE discuss some of the fundamental problems of plant cytology.[30] The treatment is interesting for their arrangement of the material, and for the development of a terminology covering the various phases of the life histories of plants based upon the nuclear conditions. Whether such elaborate systems of nomenclature really tend to clearness of expression may be open to question. They are apt to give the framework of a subject a degree of rigidity, which is found to be impracticable because it cannot yield. In a number of points their outline seems open to criticism. The statement that "there has been no evolution away from sexuality" is surprising, when one recalls the wonderful development of the kelp family, of Caulerpa, and of numbers of forms whose reproductive processes are entirely asexual, together with the remarkable extent of apogamy. The establishment of apogamy in such large and successful genera as Alchemilla, Hieracium, Antennaria, Taraxacum, and Thalictrum, indicates the possibility of apogamy in higher plants to an extent that is probably scarcely suspected.—B. M. DAVIS.

DETTO has joined the army of investigators who are taking up anew the floral color problem as related to insects.[31] In view of the experiments of FOREL,

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[29] GERARD, JOHN, *Arum maculatum* and its relations with insects. Jour. Botany **43**:231–233. 1905.

[30] COOK, O. F., and SWINGLE, W. T., Evolution of cellular structures. Bull. 81. Bureau Plant Indus., U. S. Dept. of Agric. 1905.

[31] DETTO, C., Versuche über die Blütenorientirung und das Lernen der Honigbiene. Flora **94**:424–463. 1904.

ANDREAE, GILTAY, and BUTTEL-REEPEN, he regards color attraction as established in the case of Apis and Bombus. However, the experiments of GILTAY and BUTTEL-REEPEN show that color becomes less and less a source of attraction, when bees become acquainted with the neighborhood which they frequent. Again the visits of bees to flowers that are not showy indicate that high coloration is not absolutely necessary to secure the visitation.

WERY also has attempted to find out the exact value of color as source of attraction for bees.[32] She finds that flowers with colored organs attract bees more than do flowers of the same species without colored organs, that honey does not serve to attract bees, that artificial flowers attract bees as well as do natural flowers, and that perfume attracts but little. The author thinks that she has demonstrated that color and form together offer four times as much attraction to bees as pollen, perfume, and nectar combined.—H. C. COWLES.

ADAMS has published[33] another paper on postglacial migration, in which he discusses the successive "waves" of life from the close of the Ice Age until now. After the first or tundra wave, there followed a wave from the western and northeastern centers, consisting of peat bog and conifer forest plants and animals. The third wave was from the southeastern and southwestern centers, migration taking place from the former along the coastal plain and the Mississippi River; from the southwestern center there came desert plants and animals. The paper concludes with general remarks concerning the definiteness of the laws of migration. Invading elements enter a new region at definite places, and they remain in definite associations. The succession of ecological associations is similar even in diverse regions, where the biotic components are different. A particular merit of this paper is that animals and plants are considered together, forming a biota, rather than a fauna or a flora.—H. C. COWLES.

BESSEY has continued his studies on the encroachment of the forest upon the Nebraska prairies.[34] After a general discussion of the factors involved in migration, instances are given of recent natural enlargements of the forest area. Such advances of the forest are to be observed especially where protection is afforded from fires and grazing animals. An especially favorable place for the effective germination of tree seeds is along a forest border in a moist valley, where tall weeds readily develop and choke out the prairie grasses. The forest border may advance from a few feet to several hundred feet in a single year. The paper is accompanied by maps showing the distribution within the state of each of the native Nebraska trees.—H. C. COWLES.

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[32] WERY, J., Quelques expériences sur l'attraction des abeilles par les fleurs. Bull. Acad. Roy. Belgium **1904**: 1211–1261.

[33] ADAMS, C. C., The postglacial dispersal of the North American biota. Biol. Bull. **9**: 53–71. 1905.

[34] BESSEY, C. E., Plant migration studies. Univ. Nebraska. Studies **5**: 1–27 1905.

Pammel[35] has given an interesting account of the Iowa species of Gymnosporangium whose aecidium or roestelia stage causes the rust of apple leaves. The species described are: *Gymnosporangium globosum*, *macropus*, *clavipes*, *nidus-avis*, and *clavariaeforme*. A considerable number of inoculation experiments are here reported, showing the genetic relationship between the teleutosporic stage on the red cedar and the roestelia stage on apple and other rosaceous plants. Pammel has not secured as good results in combating the apple rust by Bordeaux spraying as was reported by Emerson.[36] The removal of the cedar-apples is again recommended as the best method of preventing injury from the apple rust.—E. Mead Wilcox.

Sheldon[37] has published an account of his investigations in West Virginia of the anthracnose of the watermelon, due to *Colletotrichum lagenarium*, and minor notes regarding a few of the other diseases of cucumbers and melons. The anthracnose was successfully combated by spraying with the usual Bordeaux mixture, but the cupram did not give so good results. In a later bulletin,[38] in a way a preliminary hand-book of the diseases of that state, he presents brief notes regarding some of the more important diseases of cultivated plants observed in West Virginia during 1903 and 1904.—E. Mead Wilcox.

Minssen holds[39] that the experiments of Blanck[40] were faulty in method and his data consequently incorrect, invalidating his conclusion that the diffusion of water in humus soils is retarded by the presence of free humus acids. Minssen finds, on the contrary, that neither free humus acids nor other organic or mineral acids in dilute solutions can diminish the rate of diffusion of water or of salt solutions. The physiological dryness of humus soils, then, cannot be due to the free humus acids, nor can these influence plant growth in this particular. —C. R. B.

In the *Report of the Botanist*[41] of the Hatch Experiment Station of Massachusetts for 1904 there is given a bibliography of great value to the plant pathologist. It includes, as the title states, "Some important literature relating to diseases, etc., of crops, not generally believed to be caused by fungi and insects." This constitutes a supplement to the similar list of the literature of diseases due to parasites that was published by STURGIS.[42] Both lists should be bound together for more convenient reference by the working pathologist.—E. MEAD WILCOX.

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[35] Pammel, L. H., The cedar apple fungi and apple rust in Iowa. Bull. Iowa Exp. Stat. 84:1–36. *figs. 1–11*. 1905.

[36] Emerson, R. A., Apple scab and cedar rust. Bull. Neb. Exp. Stat. 88:1–21. *figs. 1–9*. See Bot. Gazette **40**:149. 1905.

[37] Sheldon, J. L., Diseases of melons and cucumbers during 1903 and 1904. Bull. W. Va. Exp. Stat. 94:119–138. *pls. 1–5*. 1904.

[38] Sheldon, J. L., A report on plant diseases of the state. *Idem* 96:69–99. *pl. 6* (not numbered).

[39] Minssen, H., Ueber die Diffusion in sauren und neutralen Medien, insbesonder im Humusboden. Landw. Versuchs-Stat. **62**:445–476. 1905.

[40] Blanck, Ueber die Diffusion des Wässers im Humusboden. *Idem* **58**:145. 1901.

[41] Stone, G. E., Rept. 17, Mass. Hatch Exp. Stat. **1904**:31–34. 1905.

HANS HALLIER[43] has published a curious, personally flavored account of his scheme of classification of seed plants. It is a statement of his right to be heard, a complaint that his views have been given scant attention or none at all, and a general outline of his scheme. Of course it will be taken up or discarded on its merits, without any reference to personal rights or feelings.—J. M. C.

COOK and HORNE,[44] in the first bulletin of the new Cuban Experiment Station, give the results of a year's study of the insect enemies and certain diseases of tobacco in Cuba: the seed-bed disease due to a species of *Rhizoctonia;* mosaic disease; leaf-spot due to *Cercospora nicotiana;* and an injury due to the parasitism of *Orobanche ramosa.*—E. MEAD WILCOX.

ANDREWS finds,[45] contrary to the results of DEMOOR,[46] that the nucleus cannot divide independently of the protoplasm, and that if the protoplasm is killed or temporarily disabled, the nuclear activity is soon (sometimes immediately) affected.—C. R. B.

TO THE LIST of plants which form chlorophyll in darkness Miss BITTNER adds[47] *Fegatella conica*, various mosses, the reduced leaves on fern rhizomes, the spores of Osmunda regalis, and scales of Selaginella.—C. R. B.

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[42] STURGIS, W. C., Literature of plant-diseases. Rept. 24, Conn. Exp. Stat. **1900**:255–297. 1901.

[43] HALLIER, HANS, Provisional scheme of the natural (phylogenetic) system of flowering plants. New Phytologist **4**:151–162. 1905.

[44] COOK, M. T., and HORNE, W. T., Insects and diseases of tobacco. (English edition.) Bulletion Estación Central Agronómica de Cuba 1:1–23. *figs. 1–20.* 1905.

[45] ANDREWS, F. M., The effect of gases on nuclear division. Annals of Bot. **19**:521–530. 1905.

[46] DEMOOR, Contribution à l'étude de la physiologie de la cellule. Archives de Biol. **13**:30–54. 1894.

[47] BITTNER, KAROLINA, Ueber Chlorophyllbildung im Finstern bei Kryptogamen. Oesterr. Bot. Zeits. **55**:302–312. 1905.